GOLF COURSE SUBDIVISION UNIT NO. 1
PRELIMINARY SOIL REPORT

MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

To:
KAISER-AETNA

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

SEPTEMBER 9, 1970

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

WALTER LUM
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September 9, 1970

KAISER-AETNA
P. O. Box 2997
Honolulu, Hawaii 96802

Gentlemen:

Subject: Golf Course Subdivision Unit No. 1
Preliminary Soil Report
(for site grading design purposes)
Maunalua, Oahu, Hawaii
Tax Map Key: 3-9-11
Chapter 23, Revised Ordinances of
Honolulu, 1961 As Amended

The Resort Division area consists of resort, apartment and residential subdivisions.

In accordance with your request, preliminary soil explorations were made to cover the general area. This report concerns only the preliminary soil explorations at the site for the proposed Golf Course Subdivision Unit No. 1, Maunalua, Oahu, Hawaii.

The borings generally indicated varying soil conditions with tan sandy and clayey silts in the western portion; shallow reddish-brown clayey silts and silty clays underlain by lava rock in the central portion; and gray-brown plastic clay (adobe) underlain by lava rock at the east end.

Much of the site is covered with stockpile material of gray sandy clay with localized pockets of gray clay (dredged materials).

Some grading and filling of the site are contemplated. The earthwork should be done in accordance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended and the recommendations contained herein.

The report includes a Boring Location Plan, boring logs, laboratory test results, recommendations and limitations.

Respectfully submitted,

WALTER LUM ASSOCIATES, INC.

Ezra Koike

Ezra Koike
Professional Engineer
Hawaii No. 1450

EK:rmf

C O N T E N T S

GOLF COURSE SUBDIVISION UNIT NO. 1
PRELIMINARY SOIL REPORT

MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

SCOPE OF EXPLORATION

The Resort Division area consists of resort, apartment and residential subdivisions. This report concerns only the preliminary soil explorations at the site for the proposed Golf Course Subdivision Unit No. 1 at Maunalua, Oahu, Hawaii. The limits of this area are shown on Figure 1. The purpose of this exploration was to determine general soil conditions for site grading and residential building foundation design purposes.

This report includes field exploration, laboratory tests and general recommendations for site grading and light building foundation design.

FIELD EXPLORATION

Twenty-two borings were made at the site. The locations of these borings are shown on Figure 1, Boring Location Plan. Also attached are the logs of 3 borings made for Golf Course Subdivision Unit No. 2.

The borings were made with 3 and 4-in. diameter augers using tungsten carbide bits. Soil samples were recovered with a standard split spoon driven with a 140-lb hammer falling 30 inches.

Soil samples were visually observed and subjected to appropriate tests in the laboratory. Based on visual observations and laboratory tests, the soil descriptions in the boring logs are generally made in accordance with the "Unified Soil Classification System."

LABORATORY TESTS

Laboratory tests for on-site soils included: natural water contents, Atterberg limits, specific gravity, sieve analysis, AASHO T-180-57 density, expansion and CBR.

A list of the standard field and laboratory test methods used for this project is given in the Appendix.

A summary of the laboratory test results is given in Tables IA thru IC.

GENERAL SITE CONDITIONS

The proposed subdivision site is about 1,000 to 2,000 ft north of Kalanianaole Highway and extends from the vicinity of Ehukai Street to the area north of Wawamalu Bridge. The site slopes generally down toward the east at about a 1 to 7% gradient. Wawamalu Stream out of Kalama Valley cuts thru the middle of the site in a north-south direction, while a tributary out of Mauuwai crosses the east end. Several abandoned houses, sheds and pig pens were noted along Ehukai Street at the west end of the property. Most of the west portion is covered with dense kiawe, brush and tall grass. The central portion of the area has been cleared of kiawe and stockpiled with 4 to 5 ft of gray sandy clay with localized pockets of gray clay (dredged materials). Rock outcrops were noted at the east end of the site.

INTERPRETATION OF SOIL CONDITIONS

From the field explorations, the soils at the site may be described as follows:

West Section

Surface layers of tan or brown sandy and clayey silts with decomposed mudrock generally underlain by reddish-brown silty clay and clayey silt to about 10 to 16 ft, the depths drilled.

Central Section

Surface layers of up to 4 ft of reddish-brown silty clay and clayey silt underlain by lava rock to about 10 to 20 ft, the depths drilled.

East Section

A surface layer of about 6 ft of gray-brown plastic clay (adobe) underlain by lava rock and mudrock to about 10 to 15 ft, the depths drilled.

Water was not noted in the borings during the field explorations.

For more detailed descriptions of soils encountered in the drill holes, refer to the boring logs.

DISCUSSION AND RECOMMENDATIONS

The proposed plan is to remove the stockpiled material and grade the site for subdivision development with fills generally less than about 10 ft in height.

Site Grading

All surface vegetation and miscellaneous debris should be cleared and removed prior to site filling. Localized soft pockets encountered during site preparations should be excavated and backfilled with compacted select material. Provisions to drain the site should be included during and after the completion of filling operations.

Grading work should be done in general conformance with the requirements of Chapter 23, Revised Ordinances of Honolulu, 1961 As Amended.

For the construction of fills, the following is recommended:

1. Rubble, loose boulders and unsuitable materials should be removed.

2. The stockpiles of dredged materials should be removed. Loose surface soils should generally be removed or scarified and recompacted before the placement of fills.

3. Old cesspools should be accurately located on the grading plan and backfilled before any grading work is started.

4. Hard surfaces along existing access roads should be scarified down to stiff soils and recompacted to match the density of the surrounding soils.

5. Loose surface soils along the sides and bottom of natural drainageways should be removed where fills are contemplated.

   Subdrains should be placed in a herringbone pattern along the bottom of natural drainageways or dips before the placement of fills.

6. Fill material may be approved on-site or borrow soils. If practicable, fill material imported to the site should be select soils with a plasticity index generally less than 20.

7. Fills should be constructed in approximately level layers starting at the lower end and working upward. Where fills are made on sloping areas steeper than about 5 horizontal

to 1 vertical, the ground at the toe of the fill should be benched to a generally level condition. As the fill is brought up, it should be continually keyed into the stiff natural ground by cutting steps into the slopes and compacting the fill into these steps.

8. Fills should be laid in 6-in. compacted layers with a relative density of at least 90% of AASHO T-180-57 density.

9. If clay (adobe) soils are used for fills, they should be placed preferably below 2 ft of finish grades, well above the ground water level and several feet from the face of fill slopes. See sketch attached, Figure 2. Adobe fill should be kept less than 10 ft in height and preferably less than 8 ft.

10. If boulders are proposed to be used in the construction of fills, they should generally be placed along the toe sections of fill slopes and outside of probable building sites.

Before placing any boulders, the subgrade should be stripped to stiff natural ground and shaped to drain. A layer of granular filter material should be placed on the subgrade and the boulders placed on the filter layer. The void spaces between boulders should be filled with granular material. A blanket of filter material should be placed against the boulders before any earth fills are placed against the boulders. See attached sketch, Figure 3.

Slopes

In general, cut and fill slopes of 2 horizontal to 1 vertical or flatter should be used.

For low cuts thru mixtures of rock and clinkers, slope ratios of 1-1/2 horizontal to 1 vertical or flatter may be used.

For low cuts (less than 5± ft in height) in rock that is fairly homogeneous, slope ratios of 3/4 horizontal to 1 vertical or flatter may be used.

If slope heights (top to toe) of greater than 15 ft are considered, 8-ft wide benches should be placed at height intervals of about 15 ft in both cuts and fills.

For protection against erosion, the runoff from rainstorms should be diverted by berms or ditches away from slopes whenever practicable.

The surface of fill slopes should be compacted by cat-tracking or with a sheepsfoot roller.

In general, slope planting is recommended on cut and fill slopes to minimize erosion.

Foundations

Light residential structures may be constructed at the site.

For heavy or long-span or multiple-story structures, foundation explorations should be made at each building site to evaluate the ground conditions before foundations are designed.

The following may be used as a guide for foundation design for light residential structures:

1. Bearing values for a given soil vary with the size and depth of footings. For light, one and 2-story, short-span structures, bearing values of about 2000 p.s.f. may be used.

2. Any portion of a building that is over an old cesspool should be designed to span the cesspool.

3. If soft spots or pockets of loose material are encountered in footing excavations or below a building area, they should be

excavated and replaced with compacted select on-site or borrow soils.

3. Foundation design adjustments must be made if adobe soils are encountered or imported. Care should be taken that there is at least 2 ft of compacted select material below building footings in adobe areas.

4. Concrete slab on ground should be placed over a base course of 4 in. of well-graded gravel less than 3/4 in. and greater than 1/4 in. in size. The subgrade should be compacted and shaped to a level surface or to drain, if practicable, and generally should be kept slightly higher than the finish grade outside of the building.

5. In general, buildings and structures should be placed about 15 ft from the tops of slopes.

6. Construction of retaining walls on slopes should generally be avoided.

7. Good surface drainage away from the foundation of structures should be maintained and the site should be graded at all times to prevent ponding of water.

Roadway

In general, a rough estimate of the roadway pavement thickness for the light residential traffic anticipated is as follows:

1. Wearing course - 2-in. asphaltic concrete.
2. Base course - 6-in. base course over a prepared subgrade.

Provisions should be made in the contract documents to allow for local adjustments regarding subbase requirements in the field as ground conditions are exposed at subgrade levels. The subgrade thickness will depend upon the type of material within the top 2 ft of subgrade.

The subgrade should be compacted and shaped to drain. To avoid the ponding of water and softening of the subgrade at low points, weep holes should be placed at subgrade levels through the walls of catch basins which are placed in these low areas.

Utilities

Although the probability of differential settlements in localized areas is slight in this area, utilities should be placed after the fills are constructed. Utility lines should be designed with flexible joints, particularly where lines are connected to structures. Gravity flow lines should be made as steep as practicable.

Unforeseen or undetected conditions may occur in localized areas and will have to be adjusted and corrected in the field as they are detected.

PROPOSED SPECIFICATION FOR EARTHWORK

GOLF COURSE SUBDIVISION UNIT NO. 1

General Description

This item shall consist of clearing and grubbing, removing of existing structures, preparing of land to be filled, excavating and filling of the land, spreading, compacting and testing of the fill, and subsidiary work necessary to complete the grading.

Clearing, Grubbing and Preparing Areas to be Filled

Vegetation, concrete slabs and rubbish shall be removed and disposed of, leaving the disturbed area with a neat, debris-free appearance.

Vegetable matter shall be removed from the surface upon which fill is to be placed. Topsoil and stockpiled soils shall be (1) stripped to stiff natural ground or (2) scarified and recompacted before the placement of fills. Topsoil encountered at finish grade shall be scarified and recompacted.

Hard surfaces along the existing access roads shall be scarified down to stiff soils and recompacted to match the density of the surrounding soil before the placement of fills.

Cesspools shall be flagged in the field and accurately located on the plans and backfilled before any grading work is started. The procedure for backfilling of cesspools follows in the section "Backfilling of Old Cesspools".

Where fills are proposed in sidehill areas and gullies, loose material along the bottom and the sides shall be stripped down to stiff natural ground before the placement of fills. New fills shall be keyed into the stiff natural ground.

Subdrains shall be placed along the bottom and sides of the natural drainageways before the construction of fills. The locations of subdrains should be determined in the field after clearing and grubbing.

Where fills are made on sloping areas steeper than 5 horizontal to 1 vertical, the ground at the toe of the slope shall be benched to a generally level condition. As the fill is brought up, it shall be continually keyed into the stiff natural ground by the cutting of steps into the hillside and compacting the fill into these steps. Ground slopes which are flatter than 5 horizontal to 1 vertical shall be benched when considered necessary by the Soil Engineer.

Materials

Fill materials shall consist of approved on-site or borrow soils. The soils shall contain no more than a trace of organic matter. Fill material imported to the site shall be select soils with a plasticity index less than 20.

Placing, Spreading and Compacting Fill Material

The selected fill material shall be placed in level layers which, when compacted, shall not exceed 6 inches. Each layer shall be spread evenly and thoroughly blade-mixed during the spreading to insure uniformity of material and water content within each layer.

No rocks or cobbles shall be allowed to nest and voids between rocks must be carefully filled and compacted with small stones or earth.

When the water content of the fill material is well below the optimum for compacting purposes, water shall be added until the water content assures a thorough bonding during the compacting process.

When the water content of the material is well above the optimum for compacting purposes, the fill material shall be aerated by blading or by other satisfactory methods until the water content is near the optimum.

After each layer has been placed, mixed and spread evenly, it shall be thoroughly compacted to no less than 90% of maximum density in accordance with AASHO Test No. T-180-57 or other comparable density tests. Compaction shall be with sheepsfoot rollers, multiple-wheel pneumatic-tired rollers or other acceptable rollers which shall be able to compact the fill to the specified density. Rolling shall be accomplished while the fill material is near the optimum water content. The rolling of each layer shall be continuous over its entire area and the roller shall make sufficient passes to insure the obtainment of the desired density.

Field density tests shall be made to get an indication of the compaction of the fill. Where sheepsfoot rollers are used, the soil may be disturbed to a depth of several inches. Density readings shall be taken as often as necessary in the compacted material below the disturbed surface. When these readings indicate that the density of any layer of fill or portion thereof is below the required 90% density, that layer or portion shall be reworked until the required density has been obtained.

The fill operation shall be continued in 6-in. compacted layers as specified above, until the fill has been brought to the finished slopes and grades as shown on the accepted plans.

Backfilling of Old Cesspools

The following procedures shall be followed for backfilling:

(1) Sludge Removal

Remove the sludge from the bottom of the old cesspool by (a) pumping or (b) by clamshell or any other suitable way. The material shall be disposed of away from the site. The completeness of removal shall be verified by probing and shall be less than 12 in. at the bottom.

(2) Granular Fill (below 3 ft from finish grade)

Use granular material, graded from 6 to 0 inches. The fines passing the No. 200 sieve shall be less than 10%. The materials shall be placed in thin layers (12 in. maximum) and compacted with vibratory equipment to 90% of AASHO T-180-57 density. Ramming each layer into place with a clamshell bucket will be allowed. The granular fill shall be wetted before placement into the cesspools. Sufficient compaction tests shall be conducted to verify that 90% compaction is obtained by the construction method selected.

(3) Top 3 Ft of Fill

Linings encountered in the cesspools within the top 3 ft from finish grade shall be removed. The fill within the top 3 ft from finish grade shall be constructed from on-site soil in thin layers (6-in. compacted thickness) to 90% of AASHO T-180-57 density. The material at finish grade shall blend with the surrounding soil.

Excavation

Suitable material from excavation shall be used in the fill and unsuitable material from excavation shall be diposed of.

Boulder Fills

If boulders are proposed to be used in the construction of fills, they shall be placed along the toe section of slopes and at locations indicated on the plan. The subgrade shall be stripped to stiff natural ground and shaped to drain. A layer of granular filter material shall be placed on it. All voids between boulders shall be filled with smaller granular soils. A blanket of filter material shall be placed against the boulder fill before construction of earth fills behind or above the boulders.

Unforeseen Conditions

If unforeseen or undetected critical soil conditions such as soft spots are encountered during the field operation, corrective measures shall be made in the field as they are detected.

Rainy Weather

No fill material shall be placed, spread or rolled during unfavorable weather conditions. When the work is interrupted by heavy rain, fill operations shall not be resumed until field tests indicate that the water content and density are as previously specified.

BORING LOGS

Symbols

Symbols used generally are in accordance with the Unified Soil Classification System.

Where a parenthesis "(MH)" is used, the soil sample was classified by visual observation of the sample recovered.

Where no parenthesis "MH" is used, the soil sample was classified from either the Atterberg limits or sieve analysis test results.

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 36 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: JUNE 5, 1970
Field Party: LUNING, MAESHIRO
Type of Boring: AUGER (ACKER ACE) Diam.: 4"
Elev.: 112' ± * Datum: —
Drill Bit: T.C. DRAG

Water Level: NOT NOTICED
Time: —
Date: 6-5-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 112' ± *	0								
(ML)	MEDIUM, TAN, CLAYEY SILT W/ DECOMPOSED MUDROCK			36-A	-	25	-	-	-	
(ML)	MEDIUM TO STIFF, TAN, CLAYEY SILT W/ DECOMPOSED MUDROCK	5		36-B	-	25	-	-	-	
		10		36-C	-	32	-	-	-	46
(ML)	STIFF, TAN, CLAYEY SILT W/ DECOMPOSED MUDROCK	15		36-D	-	26	-	-	-	58
	END OF BORING @ 16.0'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

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Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 37 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC. Date: JUNE 5, 1970

Field Party: LUNING, MAESHIRO

Type of Boring: AUGER (ACKER ACE) Diam.: 4"

Elev.: 94'± * Datum: —

Drill Bit: T.C. DRAG

Water Level: NOT NOTICED

Time: —

Date: 6-5-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 94'± *	0								
(ML)	MEDIUM, BROWN, CLAYEY SILT W/ DECOMPOSED MUDROCK			37-A	-	34	-	-	-	
		5								
(ML)	MEDIUM, TAN, CLAYEY SILT & DECOMPOSED MUDROCK			37-B	-	35	-	-	-	
		10								
MH	MEDIUM TO STIFF, BROWN, SILTY CLAY W/TRACES OF MUDROCK			37-C	-	38	-	-	-	
		15								
				37-D	-	37	-	-	-	
	END OF BORING @ 16.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

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Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2"ϕ-2" STANDARD SPLIT SPOON

BORING NO. 38 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: JUNE 6, 1970
Field Party: MEYER, HASHIDA
Type of Boring: AUGER (A5 JR) Diam.: 3"
Elev.: 77'± * Datum: —
Drill Bit: T.C. ROCK

Water Level				
Time	—			
Date	6-6-70			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 77'± *	0								
(ML)	MEDIUM, TAN, CLAYEY SILT W/ ORGANIC MATERIAL & TRACES OF DECOMPOSED ROCK		2"ϕ	38-A	—	26	—	—	—	
(ML)	MEDIUM, MOTTLED TAN, CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK	5	2"ϕ	38-B	—	25	—	—	—	53
(ML)	STIFF, MOTTLED BROWN, CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK	10	2"ϕ	38-C	—	35	—	—	—	82
(ML)	STIFF, TAN, CLAYEY SILT W/ TRACES OF DECOMPOSED ROCK	15	2"ϕ	38-D	—	36	—	—	—	45
	END OF BORING @ 16.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2"ϕ - 2" STANDARD SPLIT SPOON

BORING NO. 30 Sheet No. _____ of _____
Driller _____ Date JUNE 4, 1970
Field Party LUNING, MEYER
Type of Boring AUGER (A5-JR) Diam. 4"
Elev. 78' ± * Datum —
Drill Bit T.C. ROCK

Water Level				
Time	—			
Date	6-4-70			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 78' ± *	0								
(ML)	STIFF, TAN, CLAYEY SILT W/ DECOMPOSED MUDROCK		2"ϕ	30-A	-	25	-	-	-	
		5	2"ϕ	30-B	-	28	-	-	-	57
(ML)	STIFF, TAN, CLAYEY SILT	10	2"ϕ	30-C	-	35	-	-	-	72
(ML)	STIFF, TAN, CLAYEY SILT W/ DECOMPOSED ROCK	15	2"ϕ	30-D	-	27	-	-	-	
	END OF BORING @ 16.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

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Boring Log GOLF COURSE

PROJECT: SUBDIVISION UNIT NO. 1
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2"ϕ - 2" STANDARD SPLIT SPOON

BORING NO. 40 Sheet No. ____ of ____
Driller ____ Date JUNE 4, 1970
Field Party LUNING, MEYER
Type of Boring AUGER (AS-JR) Diam. 4"
Elev. 66'± * Datum —
Drill Bit T.C. ROCK

Water Level	NOT NOTICED		
Time	10:30 AM		
Date	6-4-70		

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 66'± *	0								
(ML)	STIFF, TAN, CLAYEY SILT W/ SAND & MUDROCK		2"ϕ SS	40-A	–	19	–	–	–	
(ML)	STIFF, TAN W/ WHITE STREAKS, CLAYEY SILT	5	2"ϕ SS	40-B	–	29	–	–	–	
(MH)	STIFF, MOTTLED TAN, CLAYEY SILT W/ DECOMPOSED MUDROCK	10	2"ϕ SS	40-C	–	32	–	–	–	53
(ML)	STIFF, REDDISH BROWN, CLAYEY SILT	15	2"ϕ SS	40-D	–	35	–	–	–	90
	END OF BORING @ 16.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 113 Sheet No. ____ of ____

Driller WALTER LUM ASSOC. Date JUNE 23, 1970

Field Party PANG, MAKAULA

Type of Boring AUGER (CONCORE AS-JR) Diam. 4"

Elev. 14' ± * Datum ____

Drill Bit T.C. DRAG

Water Level	NOT NOTICED			
Time	—			
Date	6-23-70			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV = 14' ± *	0								
(CH)	MEDIUM, DARK GRAY BROWN, CLAY W/ SOME DRY GRASS & ROOTS			113-A	-	26	-	-	-	
(CH)	BROWN, CLAY	5		113-B	-	50/55	-	-	-	
(MH)	STIFF, BROWN & ORANGE BROWN, CLAYEY SILT W/ DECOMPOSED ROCK	10		113-C	ROCK FRAG.					30/1"
	PUKA PUKA ROCK	15		113-D	ROCK FRAG.					30/1" HAMMER BOUNCES
	END OF BORING @ 15.1'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

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Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 114 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC. Date: JUNE 22, 1970

Field Party: PANG, MAKAULA

Type of Boring: AUGER (CONCORE AS-JR) Diam.: 4"

Elev.: 14'± * Datum: —

Drill Bit: T.C. ROCK

Water Level: NOT NOTICED

Time: —

Date: 6-22-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 14'± *	0								
(CH)	STIFF, DARK GRAY CLAY W/ ROOTS & GYPSUM CRYSTALS			114-A	–	24	–	–	–	
		5				49				
	STIFF, MOTTLED BROWN, CLAYEY SILT W/ DECOMPOSED ROCK			114-B	–	35	–	–	–	
	PUKA PUKA ROCK									
(CH)	STIFF, TAN CLAY W/ DECOMPOSED ROCK	10		114-C	–	84	–	–	–	30/2" HAMMER BOUNCES
				(ROCK FRAGMENT)						
	ROCK									
	END OF BORING @ 11.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 115 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: JUNE 23, 1970
Field Party: PANG, MAKAULA
Type of Boring: AUGER (CONCORE AS-JR) Diam.: 4"
Elev.: 13'± * Datum: —
Drill Bit: T.C. DRAG

Water Level				
Time	—			
Date	6-23-70			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 13'± *	0								
(CH)	STIFF, DARK GRAY BROWN, CLAY W/SOME DRY GRASS & ROOTS			115-A	-	29	-	-	-	
	PUKA PUKA ROCK	5		115-B	NO RECOVERY					15/0' HAMMER BOUNCES
	GRAY BLUE, DECOMPOSED ROCK W/ORANGE BROWN, SANDY SILT			115-C	ROCK FRAG.					25/2'
	PUKA PUKA ROCK	10		115-D	NO RECOVERY					20/0' HAMMER BOUNCES
	END OF BORING @ 10.0'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 119 Sheet No. ____ of ____

Driller WALTER LUM ASSOC. Date JUNE 10, 1970

Field Party PANG, MAKAULA

Type of Boring AUGER (CONCORE AB-JR) Diam. 4"

Elev. 13'± * Datum —

Drill Bit T.C. ROCK

Water Level	NOT NOTICED			
Time	—			
Date	6-10-70			

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. = 13' ± *	0								
(ML)		STIFF, REDDISH BROWN, CLAYEY SILT		U	119-A	-	19	-	-	-	31/.8"
		PUKA PUKA ROCK	5	H	119-B	NO RECOVERY					20/.0" HAMMER BOUNCES
		END OF BORING @ 10.0'	10	H	119-C	NO RECOVERY					25/.0" HAMMER BOUNCES

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log GOLF COURSE

PROJECT: SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140 #
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 120 Sheet No. _____ of _____

Driller: WALTER LUM ASSOC. Date: JUNE 18, 1970

Field Party: PANG, MAKAULA

Type of Boring: AUGER (CONCORE AS-JR) Diam.: 4"

Elev.: 15'± * Datum: —

Drill Bit: T.C. ROCK

Water Level: NOT NOTICED

Time: —

Date: 6-18-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 15'± *	0								
CH	STIFF, DARK GRAY BROWN, CLAY			120-A	-	28	-	-	-	
	TAN, DECOMPOSED MUDROCK	5		120-B	-	67 46 28	-	-	-	37/.5'
	PUKA PUKA ROCK									
	END OF BORING @ 10'	10		120-C	NO RECOVERY					15/.0' HAMMER BOUNCES

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 121 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC. Date: JUNE 16, 1970

Field Party: PANG, MAKAULA

Type of Boring: AUGER (CONCORE AB-JR) Diam.: 4"

Elev.: 20'± * Datum: —

Drill Bit: T.C. ROCK

Water Level: NOT NOTICED

Time: —

Date: 6-16-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 20'± *	0								
MH	STIFF, REDDISH BROWN, SILTY CLAY W/TRACES OF DECOMPOSED ROCK			121-A	-	23	-	-	-	
		5		121-B	NO RECOVERY					+ 15/.0' HAMMER BOUNCES
	PUKA PUKA ROCK									
		10		121-C	NO RECOVERY					+ 20/.0' HAMMER BOUNCES
	END OF BORING @ 10'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 122 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC. Date: JUNE 22, 1970

Field Party: PANG, MAKAULA

Type of Boring: AUGER (CONCORE A5 JR) Diam.: 4"

Elev.: 21'± * Datum: —

Drill Bit: T.C. ROCK

Water Level: NOT NOTICED

Time: —

Date: 6-22-70

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. = 21'± *	0								
(ML)		STIFF, REDDISH BROWN, CLAYEY SILT			122-A	-	22	-	-	-	
		PUKA PUKA ROCK	5	H	122-B	NO RECOVERY					20'/0" HAMMER BOUNCES
		END OF BORING @ 5.0'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

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Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 124 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: JUNE 22, 1970
Field Party: LUNING, MAESHIRO
Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"
Elev.: 31'± * Datum: —
Drill Bit: T.C. DRAG

Water Level				
Time				
Date	6-22-70			

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. = 31'± *	0								
ML		STIFF, RED CLAYEY SILT			124-A	-	19	-	-	-	12/1.5'
		PUKA PUKA ROCK									
		END OF BORING @ 4.5'	5		124-B	NO RECOVERY					+ 25/1.0' HAMMER BOUNCES

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 125 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: JULY 15, 1970
Field Party: HASHIDA, MAESHIRO
Type of Boring: AUGER (B-30-L) Diam.: 4"
Elev.: 27'± * Datum: —
Drill Bit: T.C. ROCK

Water Level				
Time	—			
Date	7-15-70			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. 27'± *	0								
(ML)	MEDIUM, REDDISH BROWN, SILTY CLAY			125-A	-	20	-	-	-	
	LAVA ROCK	5		125-B	ROCK FRAGMENTS					20/0" HAMMER BOUNCES
	END OF BORING @ 10.3'	10		125-C	ROCK FRAGMENTS					40/3

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

GOLF COURSE

PROJECT SUBDIVISION UNIT NO. 1

LOCATION Maunalua, Oahu, Hawaii

Tax Map Key: 3-9-11

HAMMER:

Weight 140 #

Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 126 Sheet No. _____ of _____

Driller Walter Lum Assoc. Date 5-15-70

Field Party MAKAULA, MAESHIRO

Type of Boring AUGER (CONCORE A-5 JR.) Diam. 4"

Elev. 37'± * Datum _____

Drill Bit T.C. DRAG

Water Level				
Time	NOTICED			
Date	5-15-70			

Unified Soil Classification	DRILL RATE MIN./FT.	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. 37'± *	0								
(MH)		MEDIUM, REDDISH BROWN CLAYEY SILT			126A	-	30	-	-	-	
	25		5		126B	ROCK FRAGMENTS				-	30/.1' HAMMER BOUNCES
	30	PUKA PUKA ROCK (LAVA ROCK)	10		126C	-	15	-	-	-	35/.2' HAMMER BOUNCES
	30 TO 40		15		126D	ROCK FRAGMENT				-	30/0'
		END OF BORING @ 15'±									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: Maunalua, Oahu, Hawaii

Tax Map Key: 3-9-11

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 127 Sheet No. _____ of _____

Driller Walter Lum Assoc. Date 5-11 & 14-70

Field Party GLORY, HASHIDA/CHAPMAN, MAESHIRO

Type of Boring AUGER (MOBILE B40L CONCORE ASJR.) Diam. 6" & 4"

Elev. 40'± Datum —

Drill Bit FINGER TYPE & T.C. DRAG

Water Level	NOT			
Time	NOTICED			
Date	5-11-70			

Unified Soil Classification	DRILL RATE MIN./FT.	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. 40'±	0								
(CH) (MH)		RED-BROWN CLAY STIFF, MOTTLED BROWN SILTY CLAY W/TRACES OF SAND & DECOMPOSED ROCK			127A	-	32 35	-	-	-	
	6		5		127B	ROCK FRAGMENTS		-			HAMMER BOUNCES 35/.1
	20	PUKA PUKA ROCK (LAVA ROCK)	10		127C	-	17	-	-	-	HAMMER BOUNCES 30/.2
		END OF BORING @ 15'±	15		127D	ROCK FRAGMENT		-			HAMMER BOUNCES 20/.1

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log GOLF COURSE

PROJECT: SUBDIVISION UNIT NO. 1
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 129 Sheet No. _____ of _____
Driller WALTER LUM ASSOC. Date JUNE 15, 1970
Field Party LUNING, MAESHIRO
Type of Boring AUGER (MOBILE MINUTEMAN) Diam. 3"
Elev. 59'± * Datum _____
Drill Bit T. C. ROCK

Water Level				
NOT NOTICED				
Time				
Date 6-15-70				

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. 59'± *	0								
(ML)		MEDIUM REDDISH BROWN, CLAYEY SILT			129-A	-	18	-	-	-	25/.5'
			5		129-B	ROCK	FRAG.				50/.3
		PUKA PUKA ROCK									
			10		129-C	ROCK	FRAG.				60/.5'
		END OF BORING @ 10.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 130 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC. Date: JUNE 22, 1970

Field Party: LUNING, MAESHIRO

Type of Boring: AUGER (MOBILE MINUTEMAN) Diam.: 3"

Elev.: 56'± * Datum: —

Drill Bit: T.C. DRAG

Water Level: NOT NOTICED

Time: —

Date: 6-22-70

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. 56'± *	0								
(ML)		STIFF, REDDISH BROWN SILTY CLAY			130-A	-	14	-	-	-	
		COBBLES OR PUKA PUKA ROCK	5		130-B	-	4	-	-	-	50/.5'
		LAVA ROCK			130-C	NO RECOVERY				-	20/.0' HAMMER BOUNCES
		END OF BORING @ 7.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 131 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: JUNE 12, 1970
Field Party: ASATO, MAKAULA
Type of Boring: AUGER (CONCORE A5-JR) Diam.: 4"
Elev.: 51'± * Datum: ____
Drill Bit: T.C. ROCK

Water Level					
NOT NOTICED					
Time	—				
Date	6-12-70				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV = 51'± *	0								
(MH-ML)	STIFF, REDDISH BROWN, CLAYEY SILT			131-A	-	17	-	-	-	26/.5'
		5		131-B	NO RECOVERY					15/.0' HAMMER BOUNCES
	PUKA PUKA ROCK									
		10		131-C	-	29	-	-	-	22/.5'
	VOLCANIC CINDERS OR PUKA PUKA ROCK	15		131-D	-	5	-	-	-	
		20		131-E	-	18	-	-	-	25/.5'
	END OF BORING @ 21'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 132 Sheet No. _____ of _____

Driller: WALTER LUM ASSOC. Date: JUNE 15, 1970

Field Party: ASATO, MAKAULA

Type of Boring: AUGER (CONCORE A5-JR) Diam.: 4"

Elev.: 58'± * Datum: _____

Drill Bit: T.C. ROCK

Water Level: NOT NOTICED

Time: _____

Date: 6-15-70

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
MH		STIFF, BROWN, SILTY CLAY w/ DECOMPOSED ROCK	0		132-A	-	18	-	-	-	
			5		132-B	NO RECOVERY				-	20/1.0' HAMMER BOUNCES
		PUKA PUKA ROCK	10		132-C	NO RECOVERY					35/1.2'
		END OF BORING @ 15.1'	15		132-D	NO RECOVERY					20/1'

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight 140#
Drop 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 133 Sheet No. ____ of ____

Driller WALTER LUM ASSOC. Date JUNE 10, 1970

Field Party MAKAULA, ASATO

Type of Boring AUGER (CONCORE A5 JR.) Diam. 4"

Elev. 60' ± * Datum —

Drill Bit T.C. DRAG

Water Level					
Time	—				
Date	6-10-70				

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. = 60' ± *	0								
(MH)		VERY STIFF MOTTLED BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK			133-A	–	36	–	–	–	
			5		133-B	–	38	–	–	–	20/.2' HAMMER BOUNCES
		TAN, CLAYEY SILT W/ MUDROCK									
			10								
		VOLCANIC CINDERS			133-C	–	5	–	–	–	
		END OF BORING @ 11.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 1
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight 140#
Drop 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 134 Sheet No. ____ of ____
Driller WALTER LUM ASSOC. Date JUNE 10, 1970
Field Party MAKAULA, ASATO
Type of Boring AUGER (CONCORE AS JR) Diam. 4"
Elev. 56'±* Datum —
Drill Bit T.C. DRAG

Water Level				
Time	—			
Date	6-10-70			

Unified Soil Classification	DRILL RATE	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
		ELEV. = 56'±*	0								
(MH)		STIFF, BROWN CLAYEY SILT W/TRACES OF DECOMPOSED ROCK & SOME GRAVEL			134-A	-	29	-	-	-	
			5		134-B	-	19	-	-	-	43/.5'
		MUDROCK									
			10		134-C	-	NO RECOVERY			-	20/.0' HAMMER BOUNCES
		END OF BORING @ 10'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

GOLF COURSE SUBDIVISION - UNIT I

TABLE I A - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	35	39	113	119
SAMPLE NO.	C			A
DEPTH BELOW SURFACE	10'-11.5'	SURFACE	SURFACE	0'-0.8'
DESCRIPTION	BROWN CLAYEY SILT W/SAND	BROWN SANDY SILT	GRAY CLAY	REDDISH-BROWN CLAYEY SILT
GRAIN-SIZE ANALYSIS (% Passing)				
Sieve				
1"		100	100	
1/2"		98.5	100	
#4		94.7	99.8	
#10		90.3	99.7	
#20		85.2	99.5	
#40		79.3	99.1	
#100		67.1	97.4	
#200		54.2	95.6	
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL		NATURAL	NATURAL
Liquid Limit	56		77	18
Plastic Limit	33		24	30
Plasticity Index	23		53	18
Dilatancy	SLOW		NONE	MEDIUM
Toughness	MEDIUM		HIGH	MEDIUM
Dry Strength	SLIGHT-MED		HIGH	MEDIUM
UNIFIED SOIL CLASSIFICATION	MH	MH	CH	ML
APPARENT SPECIFIC GRAVITY		2.83		
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %		24.3	25.9	
Molding Dry Density, P.C.F.		93.0	98.7	
Swell upon saturation, %		2.6	9.0	
CBR at 0.1" Penetration		14.5	1.6	
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)		A		
Dry to Wet or Wet to Dry		DRY TO WET		
Max. Dry Density (P.C.F.)		90.9		
Optimum Moisture (%)		28.4		

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 9-10-70 By BT

GOLF COURSE SUBDIVISION - UNIT I

TABLE I B - SUMMARY OF LABORATORY TEST RESULTS

BORING NO.	120	124	132	
SAMPLE NO.	A			
DEPTH BELOW SURFACE	0'-1.5'	SURFACE	SURFACE	
DESCRIPTION	DARK GRAY BROWN CLAY	REDDISH-BROWN CLAYEY SILT W/SAND	REDDISH-BROWN CLAYEY SILT	
GRAIN-SIZE ANALYSIS (% Passing) Sieve				
1"		100		
1/2"		96.9		
#4		96.1		
#10		94.9		
#20		93.4		
#40		92.0		
#100		87.2		
#200		77.9		
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	
Liquid Limit	89	48	51	
Plastic Limit	27	31	33	
Plasticity Index	62	17	18	
Dilatancy	NONE	SLOW	SLOW	
Toughness	HIGH	MEDIUM	MEDIUM	
Dry Strength	HIGH	SLIGHT-MED.	SLIGHT-MED.	
UNIFIED SOIL CLASSIFICATION	CH	ML	MH	
APPARENT SPECIFIC GRAVITY		2.99		
EXPANSION AND CBR TESTS (Surcharge-51 P.S.F.)				
Molding Moisture, %		30.7		
Molding Dry Density, P.C.F.		96.5		
Swell upon saturation, %		0.9		
CBR at 0.1" Penetration		12.5		
MOISTURE-DENSITY RELATIONS OF SOILS (AASHO T-180-57 Method ___)		A		
Dry to Wet or Wet to Dry		DRY TO WET		
Max. Dry Density (P.C.F.)		98.3		
Optimum Moisture (%)		25.7		

REMARKS:

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 9-10-70 By BT

GOLF COURSE SUBDIVISION - UNIT I

TABLE I C - SUMMARY OF LABORATORY TEST RESULTS

STOCKPILE AREA	A	B	C	D
SAMPLE NO.				
DEPTH BELOW SURFACE	SURFACE	SURFACE	SURFACE	SURFACE
DESCRIPTION	GRAY SANDY CLAY W/SHELLS	GRAY SANDY CLAY W/SHELLS	GRAY SANDY CLAY W/CORAL FRAG. & SHELLS	
GRAIN-SIZE ANALYSIS				
(% Passing)				
Sieve				
1"		100	96.4	100
1/2"		100	94.1	96.5
#4		98.5	90.5	92.4
#10		96.6	87.5	90.0
#20		93.8	82.8	85.6
#40		90.4	75.3	79.5
#100		82.0	61.4	70.5
#200		76.6	55.4	67.5
ATTERBERG LIMITS				
Air Dried or Natural	NATURAL	NATURAL	NATURAL	NATURAL
Liquid Limit	44	53	44	36
Plastic Limit	19	22	20	17
Plasticity Index	25	31	24	19
Dilatancy	SLOW	SLOW	QUICK	QUICK
Toughness	MEDIUM	MED-HIGH	SLIGHT	SLIGHT
Dry Strength	MEDIUM	MEDIUM	SLIGHT-MED.	SLIGHT-MED.
UNIFIED SOIL CLASSIFICATION	CL	CH	CL	CL
APPARENT SPECIFIC GRAVITY		2.96		
EXPANSION AND CBR TESTS				
(Surcharge-51 P.S.F.)				
Molding Moisture, %	22.0	24.2		
Molding Dry Density, P.C.F.	102.9	102.3		
Swell upon saturation, %	1.5	1.1		
CBR at 0.1" Penetration	13.0	13.4		
MOISTURE-DENSITY RELATIONS OF SOILS				
(AASHO T-180-57 Method ___)		A		
Dry to Wet or Wet to Dry		DRY TO WET		
Max. Dry Density (P.C.F.)		101.5		
Optimum Moisture (%)		20.0		

REMARKS:

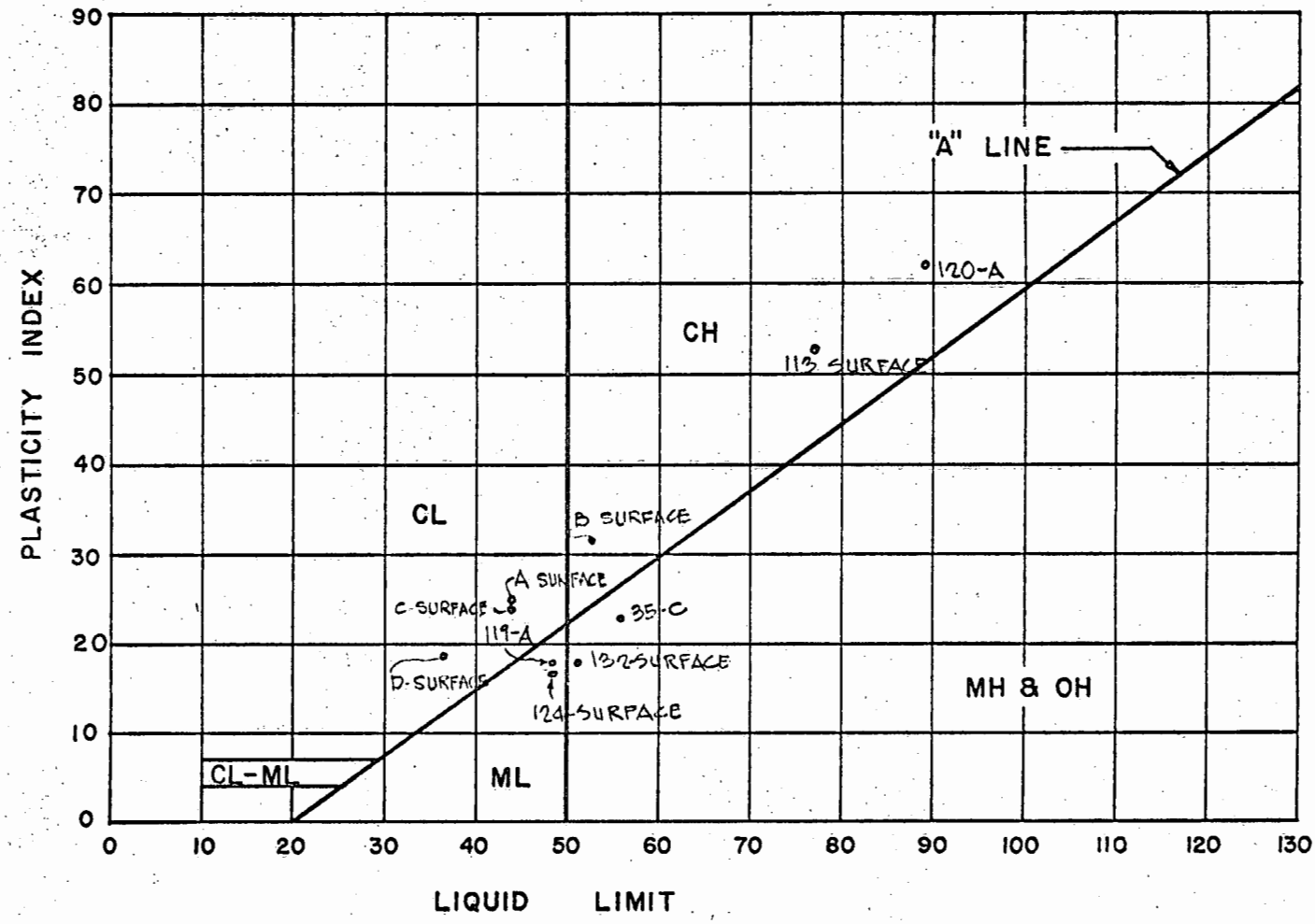
WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

Date 9-15-70 By BT

PLASTICITY CHART

PROJECT: GOLF COURSE SUBDIVISION - UNIT 1

LOCATION: MAUNALUA, OAHU, HAWAII



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 9-15-70 BY B.T.

MOISTURE-DENSITY CURVE (AASHO T-180-57, METHOD A)

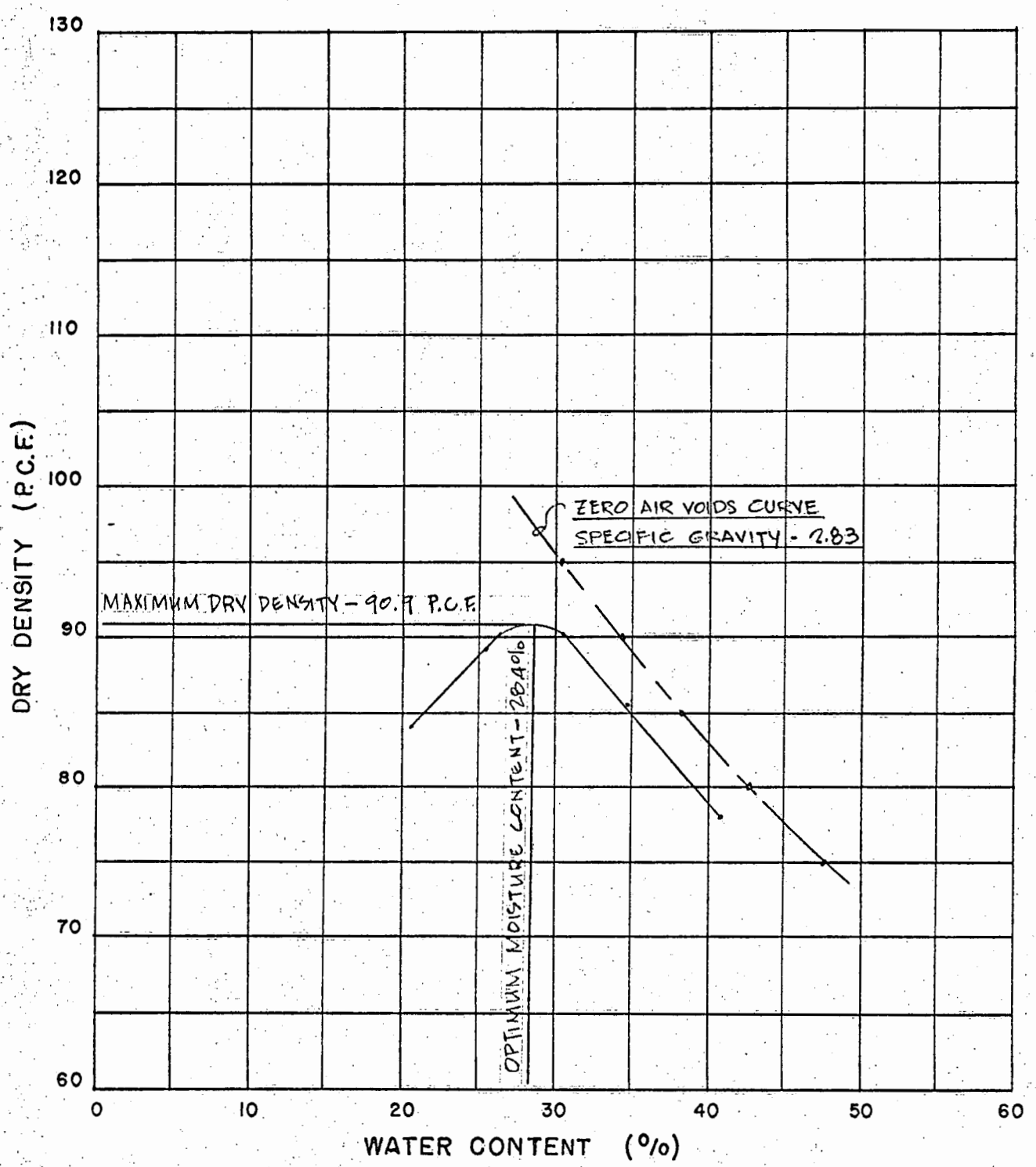
PROJECT: GOLF COURSE SUBDIVISION - UNIT I

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO.: 39 - SURFACE

SAMPLE DESCRIPTION: BROWN SANDY SILT

AGGREGATE: 1/4" MINUS
MOLD SIZE: 4" & 4.59"
HAMMER: 10 LBS. 18" DROP
LAYERS: 5
BLOWS: 25 PER LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 8-7-70 BY S.T.

MOISTURE-DENSITY CURVE (AASHO T-180-57, METHOD A)

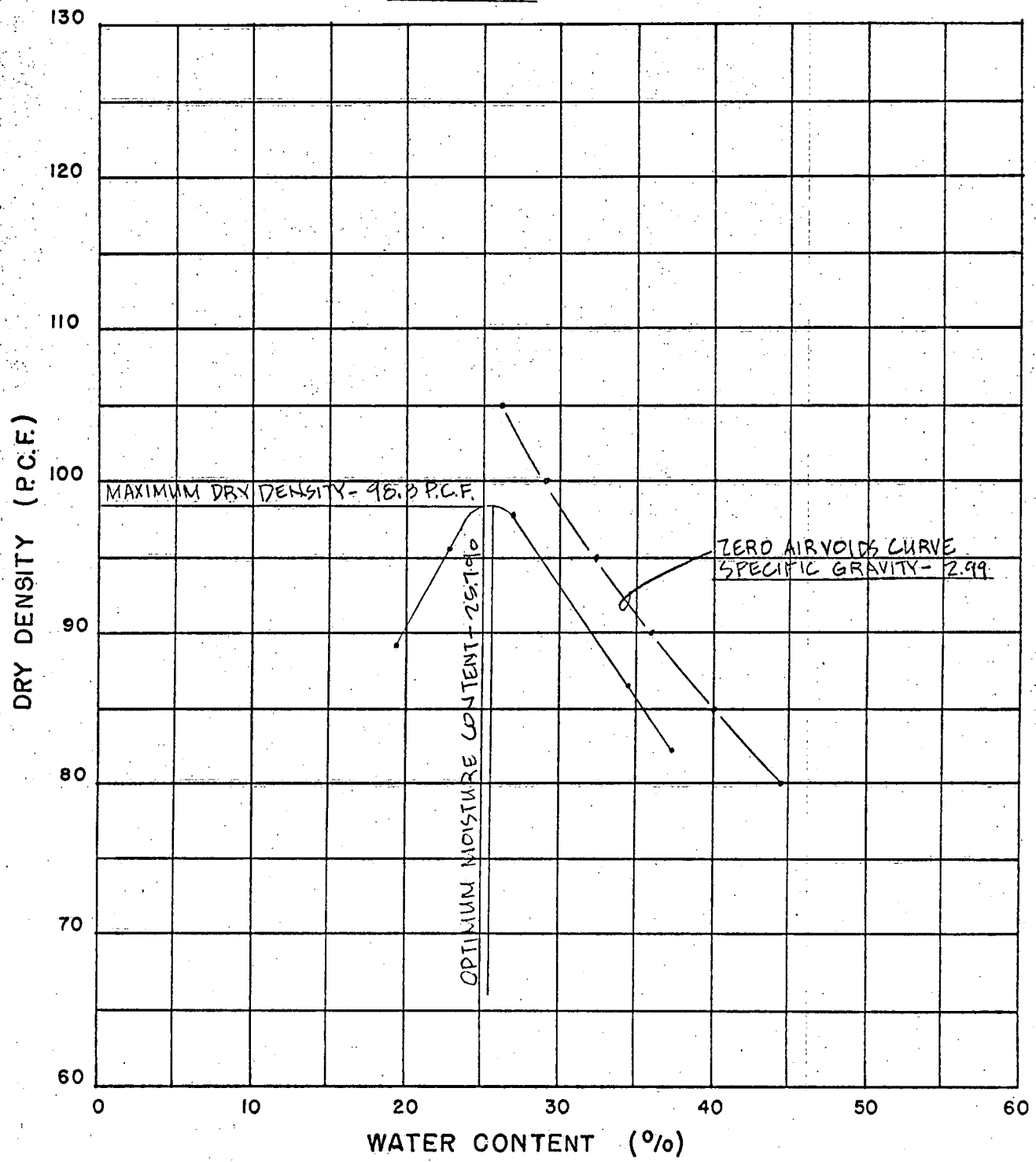
PROJECT: GOLF COURSE SUBDIVISION - UNIT I

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO.: 124 - SURFACE

SAMPLE DESCRIPTION: REDDISH BROWN CLAYEY SILT WITH SAND

AGGREGATE: 1/4" MINUS
MOLD SIZE: 4" ⌀ 4.59"
HAMMER: 10LBS 18" DROP
LAYERS: 5
BLOWS: 25 PER LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 8-7-70 BY S.T.

9-470

MOISTURE–DENSITY CURVE (AASHO T-180-57, METHOD A)

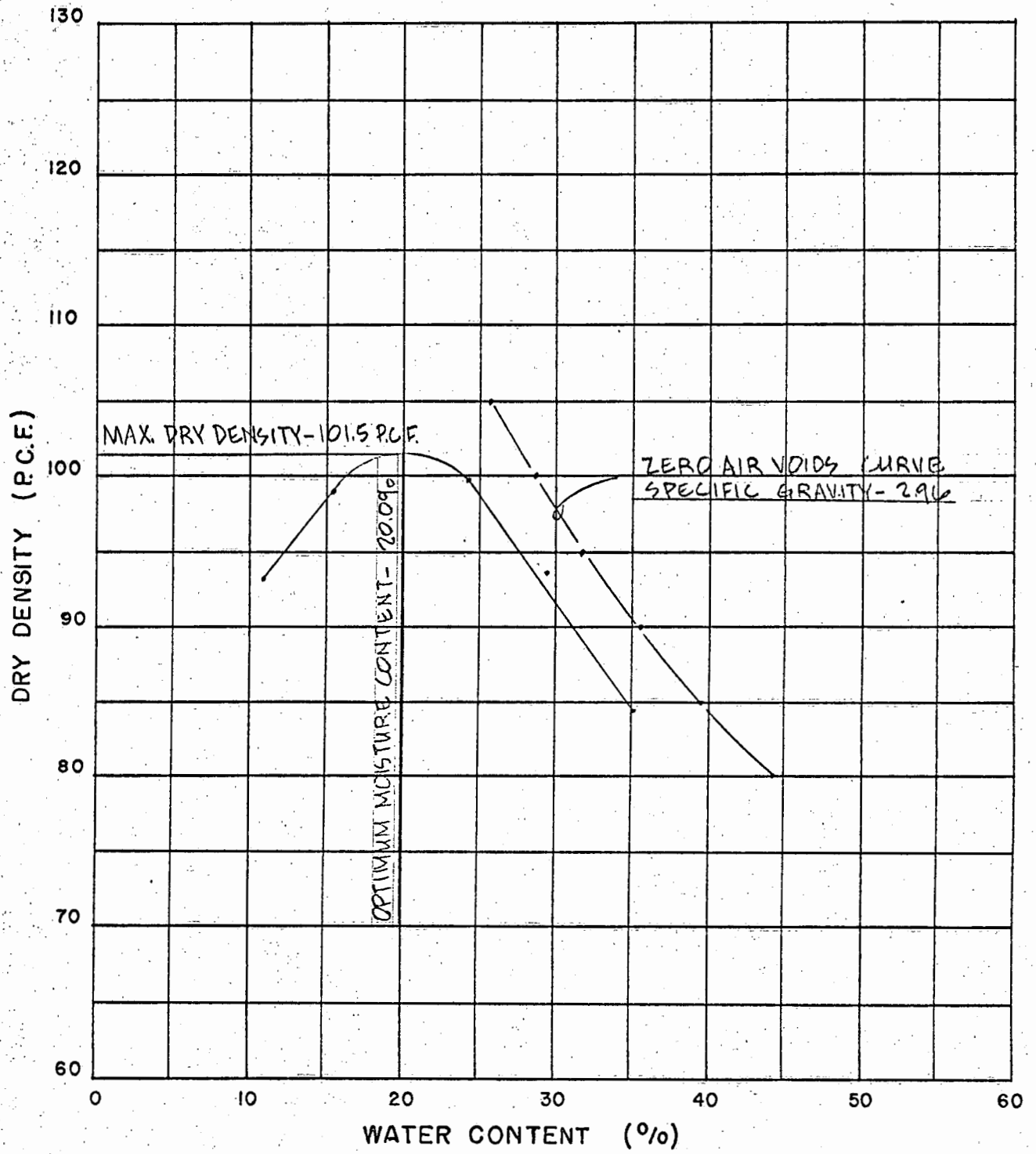
PROJECT: GOLF COURSE SUBDIVISION - UNIT I

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO.: B

SAMPLE DESCRIPTION: GRAY SANDY CLAY W/SHELLS

AGGREGATE: 1/4" MINUM
MOLD SIZE: 4" & 4.59"
HAMMER: 10LBS. 18" DROP
LAYERS: 5
BLOWS: 25 PER LAYER



WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

DATE 8-12-70 BY S.T.

9-470

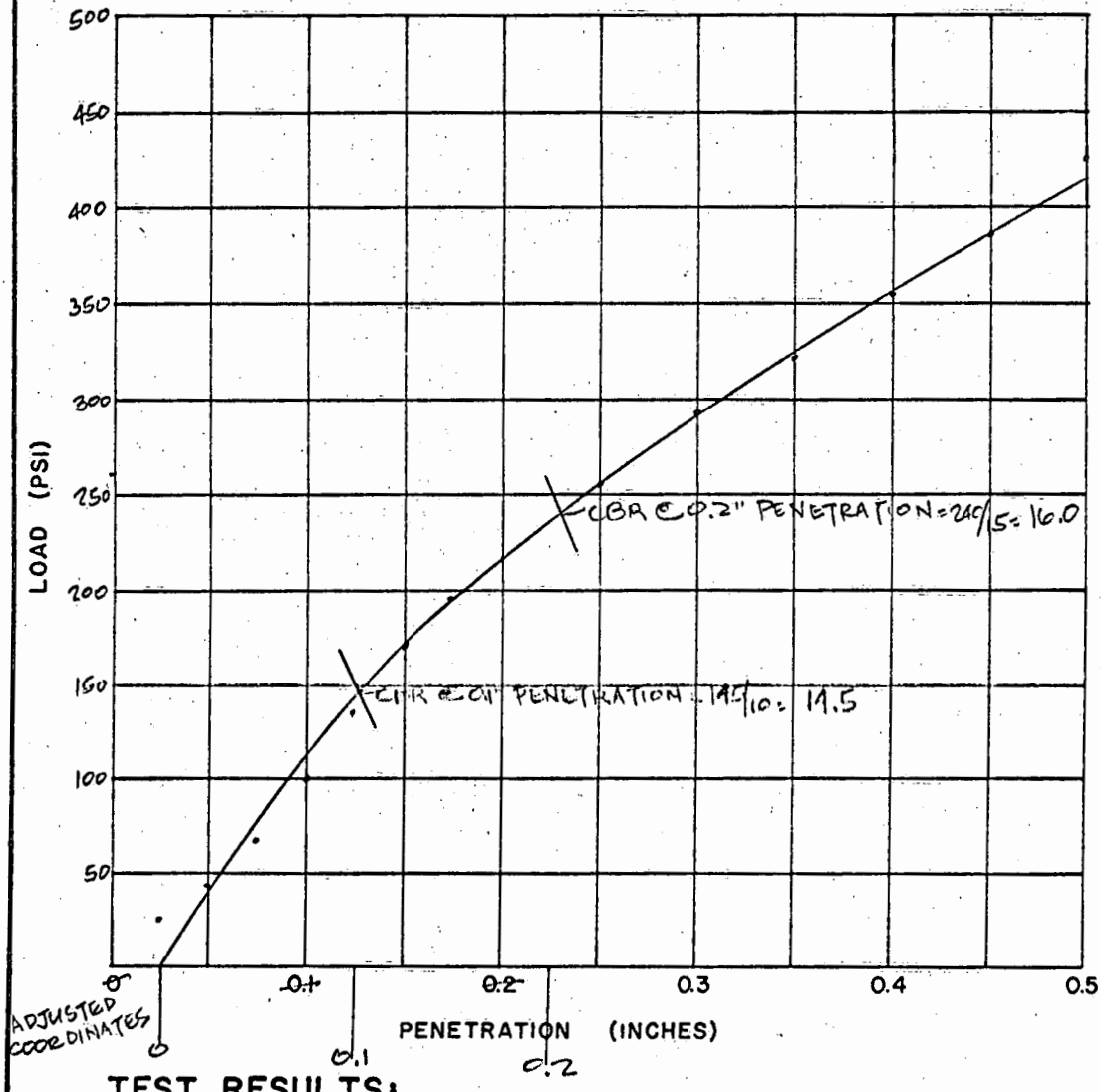
CBR TEST

PROJECT: GOLF COURSE SUBDIVISION - UNIT 1

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO: 39 - SURFACE

SAMPLE DESCRIPTION: BROWN SANDY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	70	23
0.050	130	43
0.075	200	67
0.100	300	100
0.125	405	135
0.150	510	170
0.175	590	197
0.200	650	217
0.250	765	255
0.300	880	293
0.350	970	323
0.400	1065	355
0.450	1160	387
0.500	1275	425

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56/LAYER

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 24.3

MOLDING DRY DENSITY, P.C.F. 93.0

CBR @ 0.1" PENETRATION 14.5

DATE 8-1-70 BY R.M.

DATE 8-10-70 BY C.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

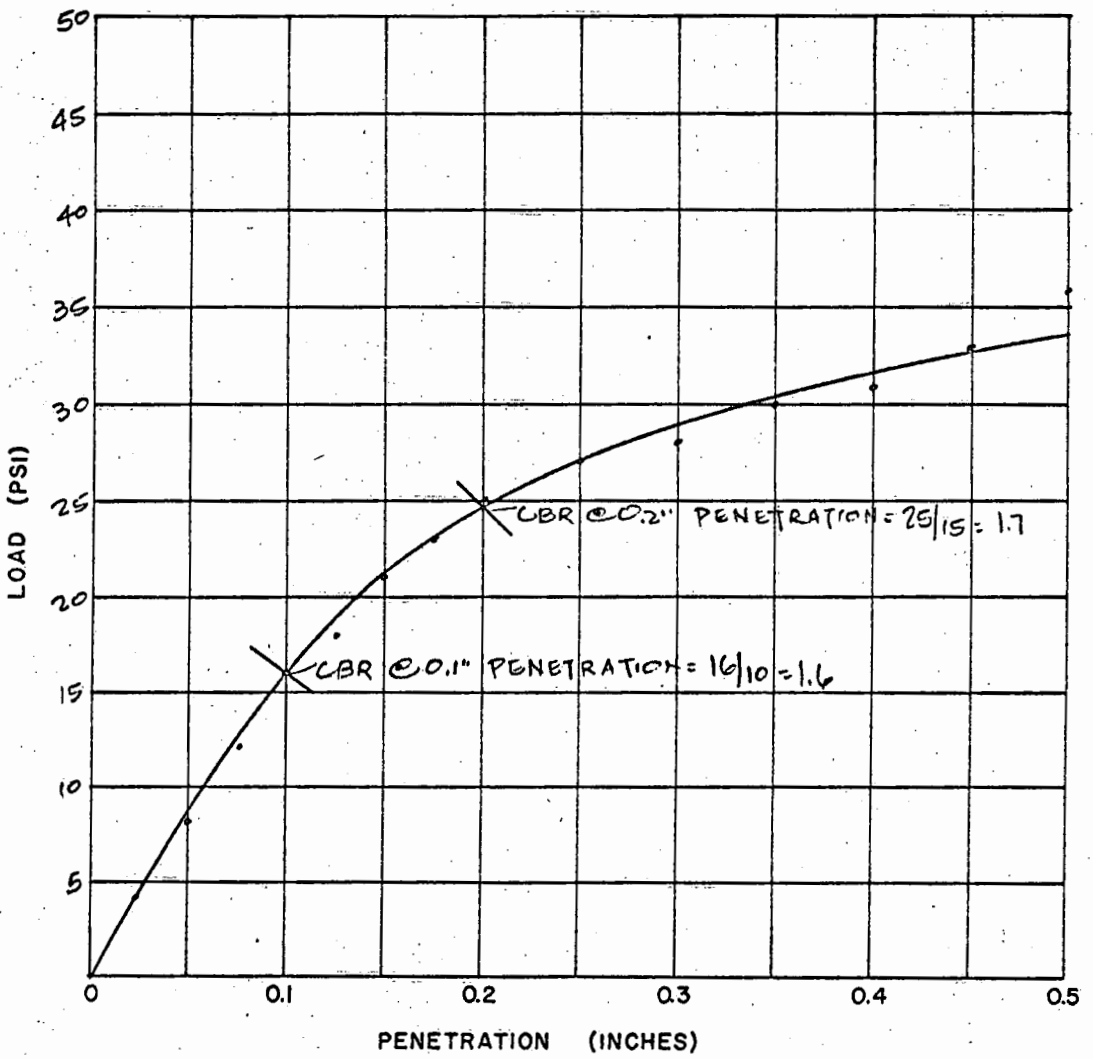
CBR TEST

PROJECT: GOLF COURSE SUBDIVISION - UNIT 1

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO: 113-SURFACE

SAMPLE DESCRIPTION: GRAY CLAY



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	11	4
0.050	24	8
0.075	36	12
0.100	47	16
0.125	55	18
0.150	62	21
0.175	69	23
0.200	74	25
0.250	80	27
0.300	84	28
0.350	89	30
0.400	94	31
0.450	100	33
0.500	107	36

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 25.9

MOLDING DRY DENSITY, P.C.F. 98.7

CBR @ 0.1" PENETRATION 1.6

DATE 8-7-70 BY C.M.

DATE 8-12-70 BY S.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

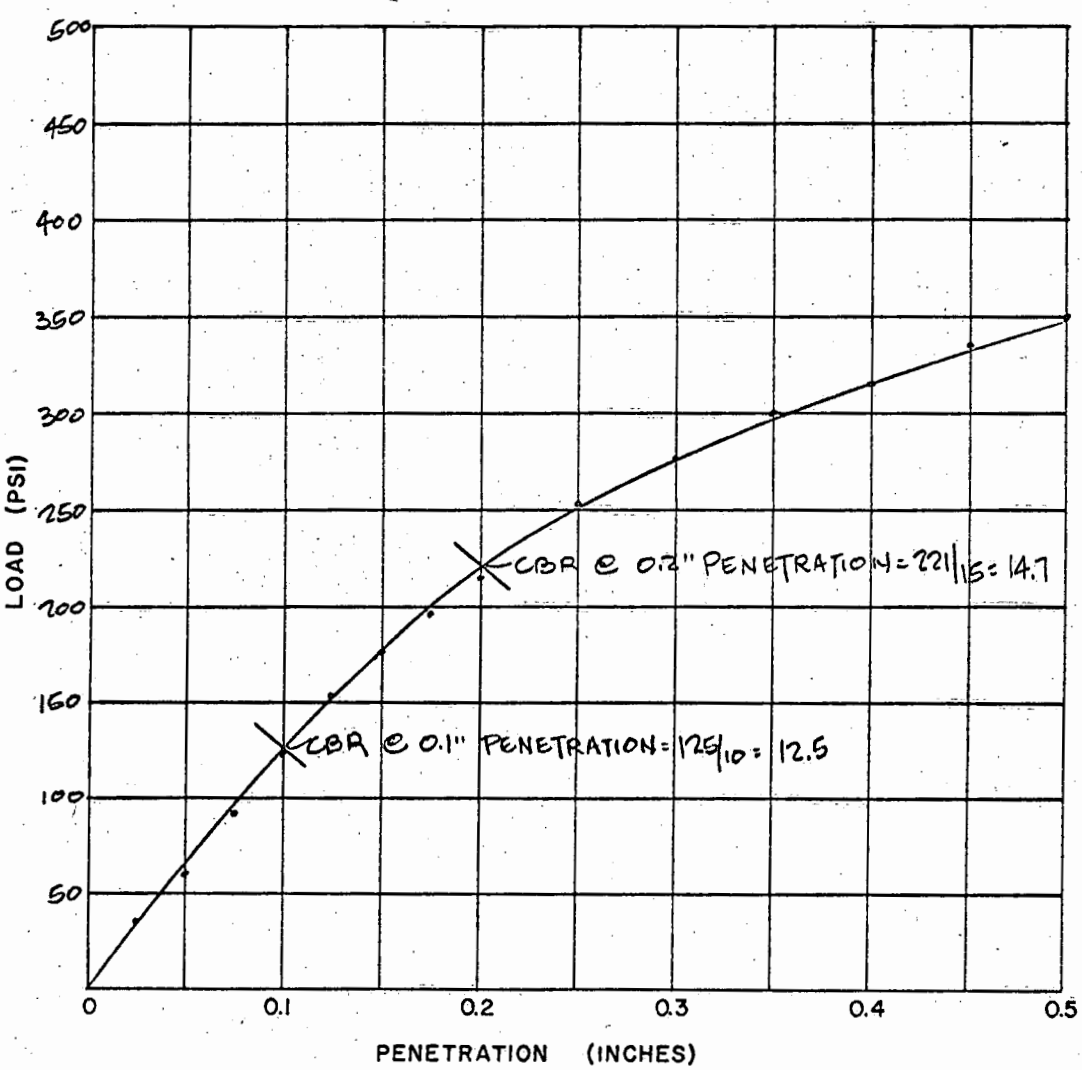
CBR TEST

PROJECT: GOLF COURSE SUBDIVISION - UNIT I

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO: 124 SURFACE

SAMPLE DESCRIPTION: REDDISH BROWN CLAYEY SILT WITH SAND



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	105	35
0.050	180	60
0.075	275	92
0.100	370	123
0.125	460	153
0.150	535	178
0.175	595	198
0.200	650	217
0.250	755	252
0.300	830	277
0.350	900	300
0.400	950	317
0.450	1010	337
0.500	1050	350

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 30.7

MOLDING DRY DENSITY, P.C.F. 96.5

CBR @ 0.1" PENETRATION 12.5

DATE 8-5-70 BY R.M.

DATE 8-11-70 BY S.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

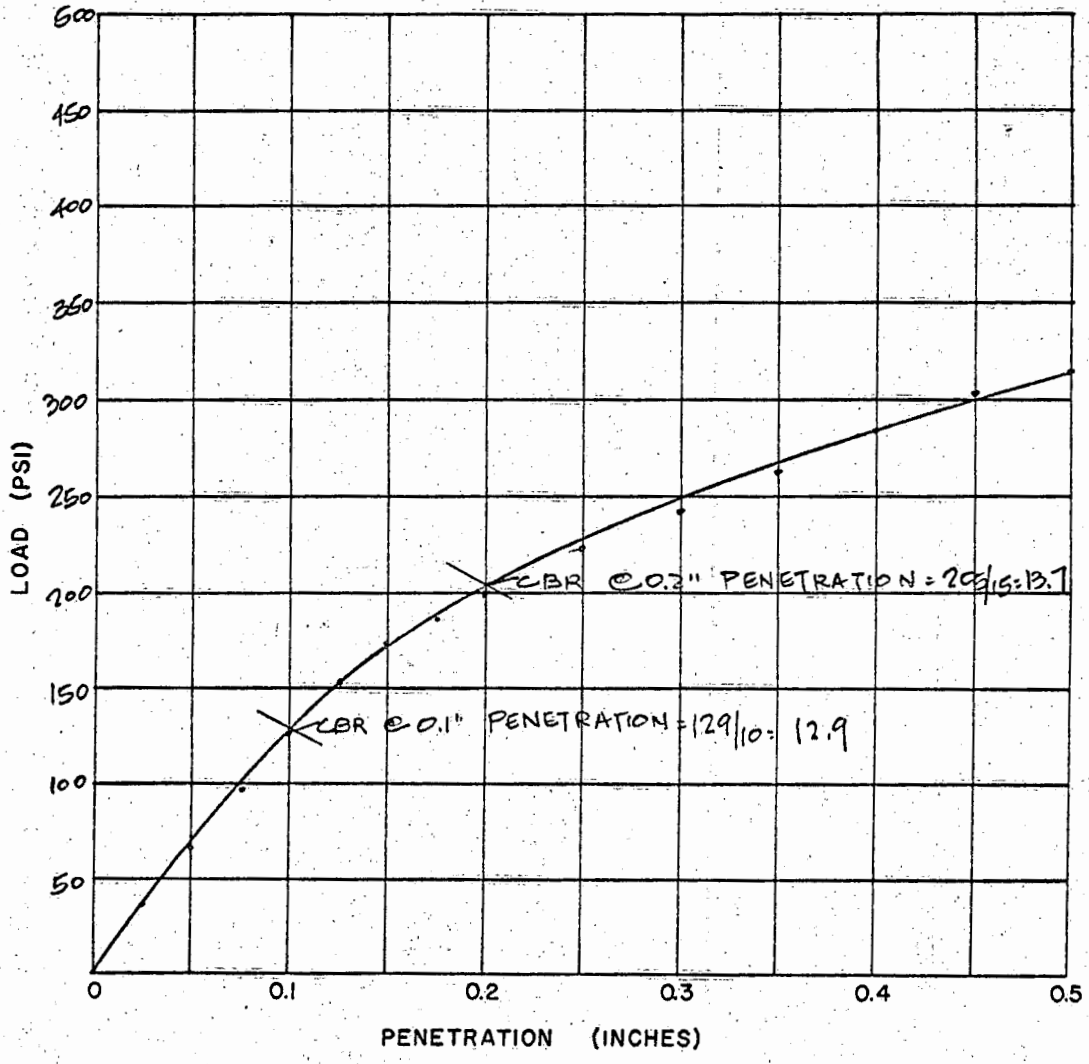
CBR TEST

PROJECT: GOLF COURSE SUBDIVISION - UNIT 1

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO: 132 - SURFACE

SAMPLE DESCRIPTION: REDDISH-BROWN CLAYEY SILT



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	105	35
0.050	195	65
0.075	290	97
0.100	380	127
0.125	460	153
0.150	520	173
0.175	560	187
0.200	600	200
0.250	670	223
0.300	730	243
0.350	790	263
0.400	855	285
0.450	910	303
0.500	955	318

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 27.4

MOLDING DRY DENSITY, P.C.F. 96.4

CBR @ 0.1" PENETRATION 12.9

DATE 8-5-70 BY R.M.

DATE 8-11-70 BY S.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

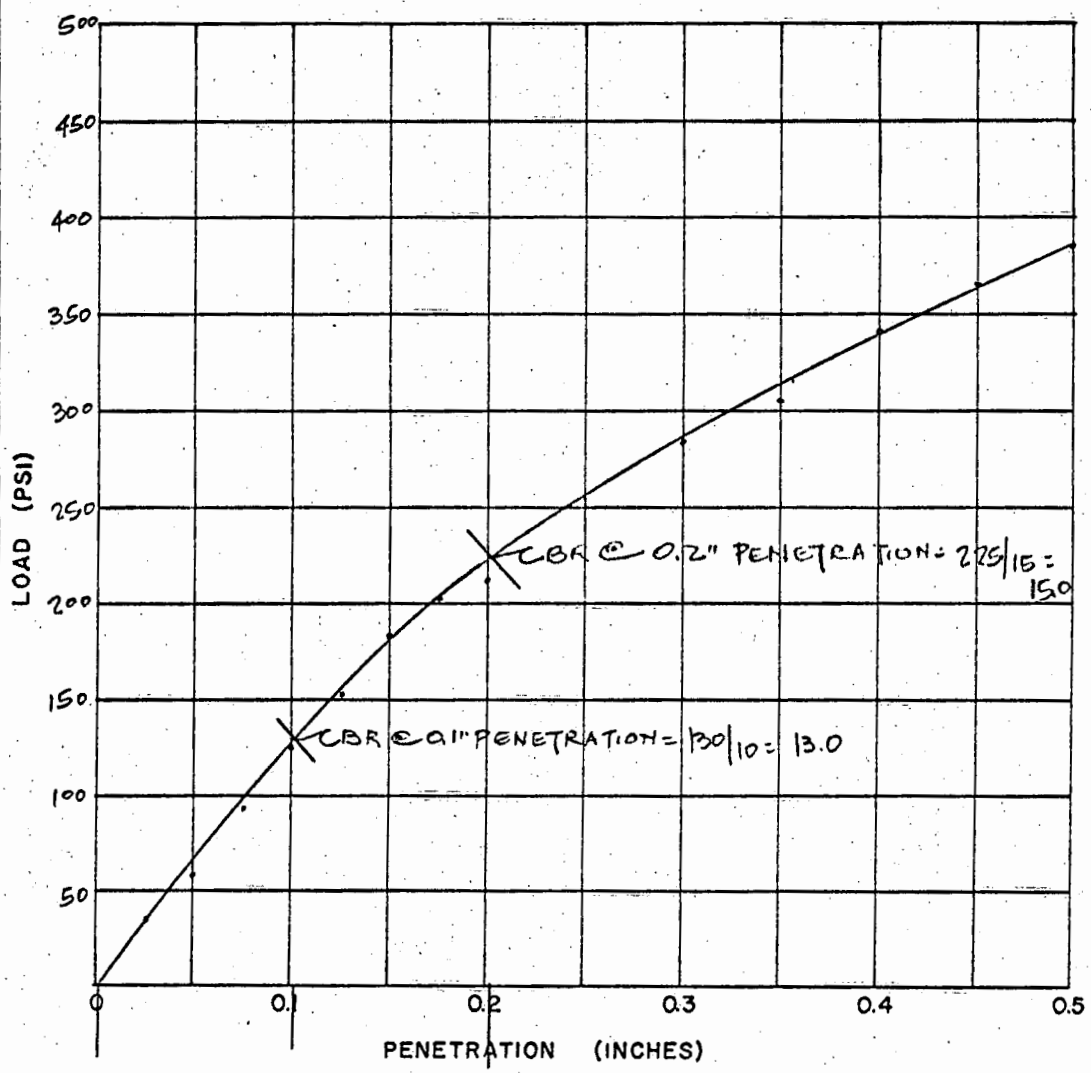
CBR TEST

PROJECT: GOLF COURSE SUBDIVISION - UNIT 1

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO: A

SAMPLE DESCRIPTION: GRAY SANDY CLAY W/SHELLS



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	100	33
0.050	175	58
0.075	275	92
0.100	375	125
0.125	460	153
0.150	545	182
0.175	605	202
0.200	670	223
0.250	765	255
0.300	855	286
0.350	950	317
0.400	1030	343
0.450	1100	367
0.500	1160	387

AGGREGATE 1/4" MINUS

HAMMER WEIGHT 10 LBS.

HAMMER DROP 18"

No. OF BLOWS 56

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 22.0

MOLDING DRY DENSITY, P.C.F. 102.9

CBR @ 0.1" PENETRATION 13.0

DATE 8-7-70 BY C.M.

DATE 8-12-70 BY ST.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

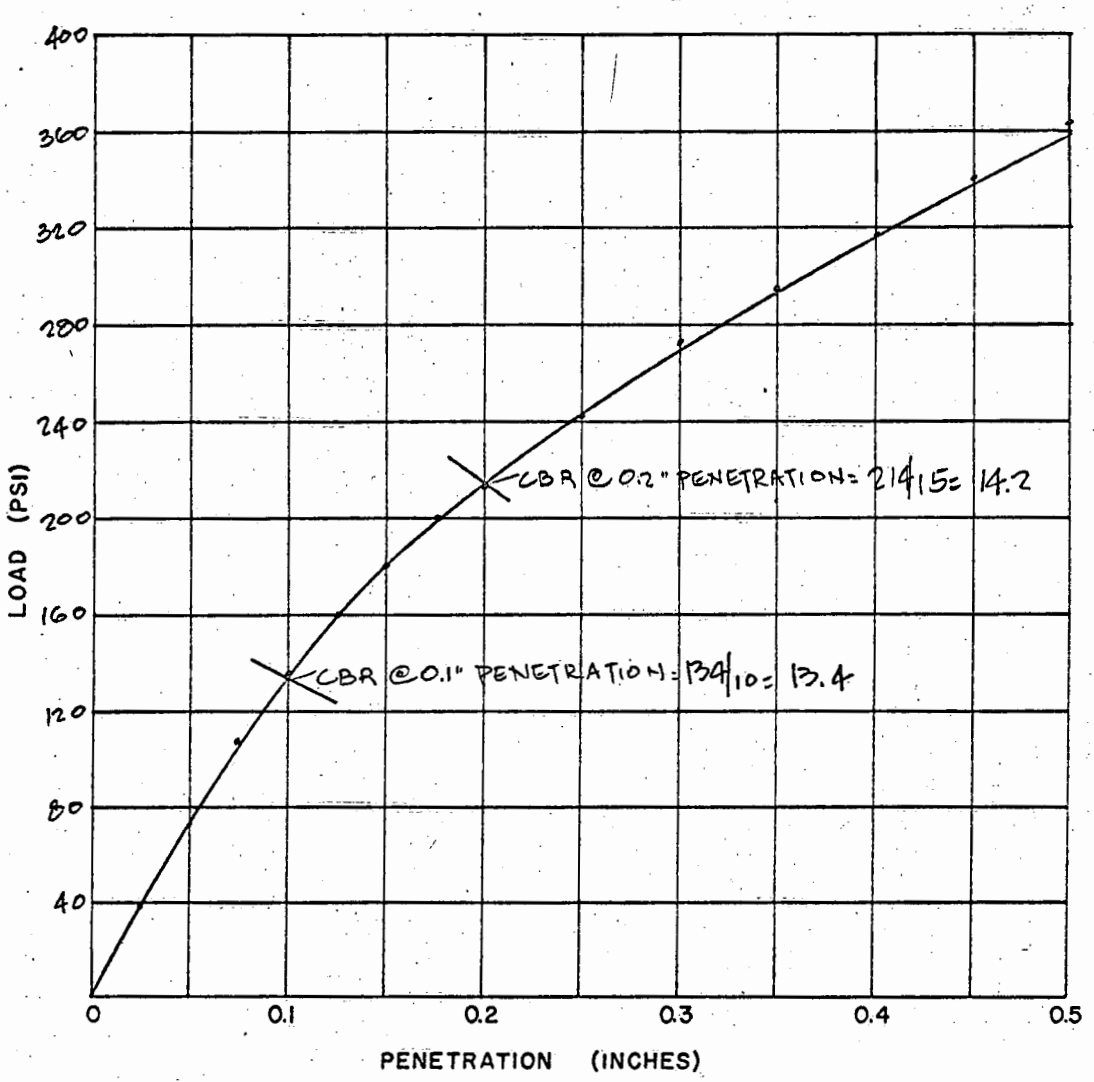
CBR TEST

PROJECT: GOLF COURSE SUBDIVISION - UNIT 1

LOCATION: MAUNALUA, OAHU, HAWAII

SAMPLE NO: B

SAMPLE DESCRIPTION: GRAY SANDY CLAY W/SHELLS



CBR PENETRATION DATA

PENETRATION (INCHES)	LOAD (LBS.)	LOAD (PSI)
0.025	115	38
0.050	215	72
0.075	325	108
0.100	405	135
0.125	480	160
0.150	540	180
0.175	600	200
0.200	640	213
0.250	725	242
0.300	815	272
0.350	885	295
0.400	950	317
0.450	1020	340
0.500	1090	363

AGGREGATE 1/4 MINUS

HAMMER WEIGHT 10 LBS

HAMMER DROP 18"

No. OF BLOWS 56

No. OF LAYERS 5

TEST RESULTS:

MOLDING MOISTURE, %. 24.2

MOLDING DRY DENSITY, P.C.F. 102.3

CBR @ 0.1" PENETRATION 13.4

DATE 8-11-70 BY C.M.

DATE 8-17-70 BY S.T.

WALTER LUM ASSOCIATES, INC.
CIVIL, STRUCTURAL, SOILS ENGINEERS

10-470

LOGS OF BORINGS

FROM

"GOLF COURSE SUBDIVISION UNIT NO. 2"

REPORT DATED SEPTEMBER 19, 1970

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 2
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 32 Sheet No. ____ of ____
Driller: WALTER LUM ASSOC. Date: JUNE 8, 1970
Field Party: LUNING, MAESHIRO
Type of Boring: AUGER (ACKER ACE) Diam.: 4"
Elev.: 80' ± * Datum: ——
Drill Bit: T.C. DRAG

Water Level					
Time	——				
Date	6-8-70				

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 80'± *	0								
(ML-GM)	STIFF, TAN SANDY SILT W/MUDROCK	5		32-A	-	19	-	-	-	
				32-B	-	31	-	-	-	
		10		32-C	-	28	-	-	-	
		15		32-D	-	30	-	-	-	
	END OF BORING @ 16.5'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 2

LOCATION: MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"

SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 34 Sheet No. ____ of ____

Driller: WALTER LUM ASSOC Date: JUNE 8, 1970

Field Party: ASATO, MAKAULA

Type of Boring: AUGER (CONCORE AS-JR) Diam.: 4"

Elev.: 100'± * Datum: ____

Drill Bit: T.C. DRAG

Water Level: NOT NOTICED

Time: ____

Date: 6-8-70

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sampler	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. =100'± *	0		34-A	-	20	-	-	-	
(ML-GM)	STIFF, TAN, SANDY SILT & MUDROCK	5		34-B	-	21	-	-	-	23/.5'
		10		34-C	-	25	-	-	-	
		15		34-D	-	23	-	-	-	35/.2'
	PUKA PUKA ROCK									
	END OF BORING @ 15.7'									

* ELEVATION ESTIMATED FROM CONTOUR PLAN

WALTER LUM ASSOCIATES

3030 WAIALAE AVENUE • HONOLULU, HAWAII 96816 • PHONE 737-7931

Boring Log

PROJECT: GOLF COURSE SUBDIVISION UNIT NO. 2
LOCATION: MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

HAMMER:
Weight: 140#
Drop: 30"
SAMPLER: 2" STANDARD SPLIT SPOON

BORING NO. 35 Sheet No. ____ of ____
Driller ____ Date JUNE 4, 1970
Field Party ASATO, MAESHIRO
Type of Boring AUGER (ACKER ACE) Diam. 4"
Elev. 93'± * Datum —
Drill Bit T.C. DRAG

Water Level				
Time				
Date	6-4-70			

Unified Soil Classification	DESCRIPTION	Depth (Ft.)	Sample No.	Wet Dens. P.C.F.	Water Cont. %	Dry Dens. P.C.F.	Unconf. Comp. P.S.F.	Vane Shear P.S.F.	PENETRATION DATA: Standard Penetration Test, N (Blows per foot) 0 10 20 30 40
	ELEV. = 93'± *	0							
(ML)	MEDIUM, TAN, CLAYEY SILT W/ MUDROCK	5	35-A	-	25	-	-	-	
			35-B	-	20	-	-	-	
		10	35-C	-	28	-	-	-	47
MH	MEDIUM TO STIFF, BROWN, CLAYEY SILT W/SAND	15	35-D	-	28	-	-	-	50
	END OF BORING @ 16.0'								

* ELEVATION ESTIMATED FROM CONTOUR PLAN

GENERAL TESTING METHODS

EXPLORATORY BORINGS AND SAMPLING

Method for soil investigation and sampling by auger borings (Tentative)	ASTM Designation: D 1452-63T
Method for thin wall tube sampling of soils (Tentative)	ASTM Designation: D 1587-63T
Method for penetration test and split barrel sampling of soils (Tentative)	ASTM Designation: D 1586-64T

LABORATORY TESTING

Grading Analysis

Sieve analysis of fine and coarse aggregates	AASHO Designation: T 27-60
Amount of material finer than No. 200 sieve in aggregate	AASHO Designation: T 11-60

Atterberg Limits

Determining the liquid limit of soils Modified as follows: Substitute Casagrande grooving tool. Tests conducted from natural moisture content unless noted otherwise.	AASHO Designation: T 89-60
Determining the plastic limit of soils	AASHO Designation: T 90-56
Calculating the plasticity index of soils	AASHO Designation: T 91-54

Specific Gravity

Specific gravity of soils Modified as follows: 500 ML Pycnometer	AASHO Designation: T 100-60

Expansion and CBR Tests

Expansion test and California Bearing Ratio (CBR)	Section VIII - TM 5-530 "Materials Testing" by Headquarters, Dept. of the Army

Compaction Test

Moisture-Density relations of soils using a 10# rammer and an 18" drop	AASHO Designation: T 180-57

Unified Soil Classification

Designation E-3 from "Earth Manual" by the United States Department of the Interior Bureau of Reclamation

GENERAL TESTING METHODS

Consolidation Test

Chapter IX
"Soil Testing for Engineers"
by T. William Lambe
The Massachusetts Institute
of Technology

Laboratory Shear Test

Laboratory shear test using the Torvane

Brochure by Soiltest, Inc.

LIMITATIONS

In general, soil formations are commonly erratic and rarely uniform or regular. The boring logs indicate the approximate subsurface soil conditions encountered only at the drill holes where the borings were made at the times designated on the logs and may not represent conditions at other locations or at other dates. Soil conditions and water levels may change with the passage of time and construction methods or improvements at the site.

During construction, should subsurface conditions much different from those in the borings be observed, encountered, or otherwise indicated, we should be advised immediately to review or reconsider our recommendations in light of the new developments.

Our professional services were performed, findings obtained and recommendations prepared in accordance with generally accepted engineering practices. This warranty is in lieu of all other warranties expressed or implied.

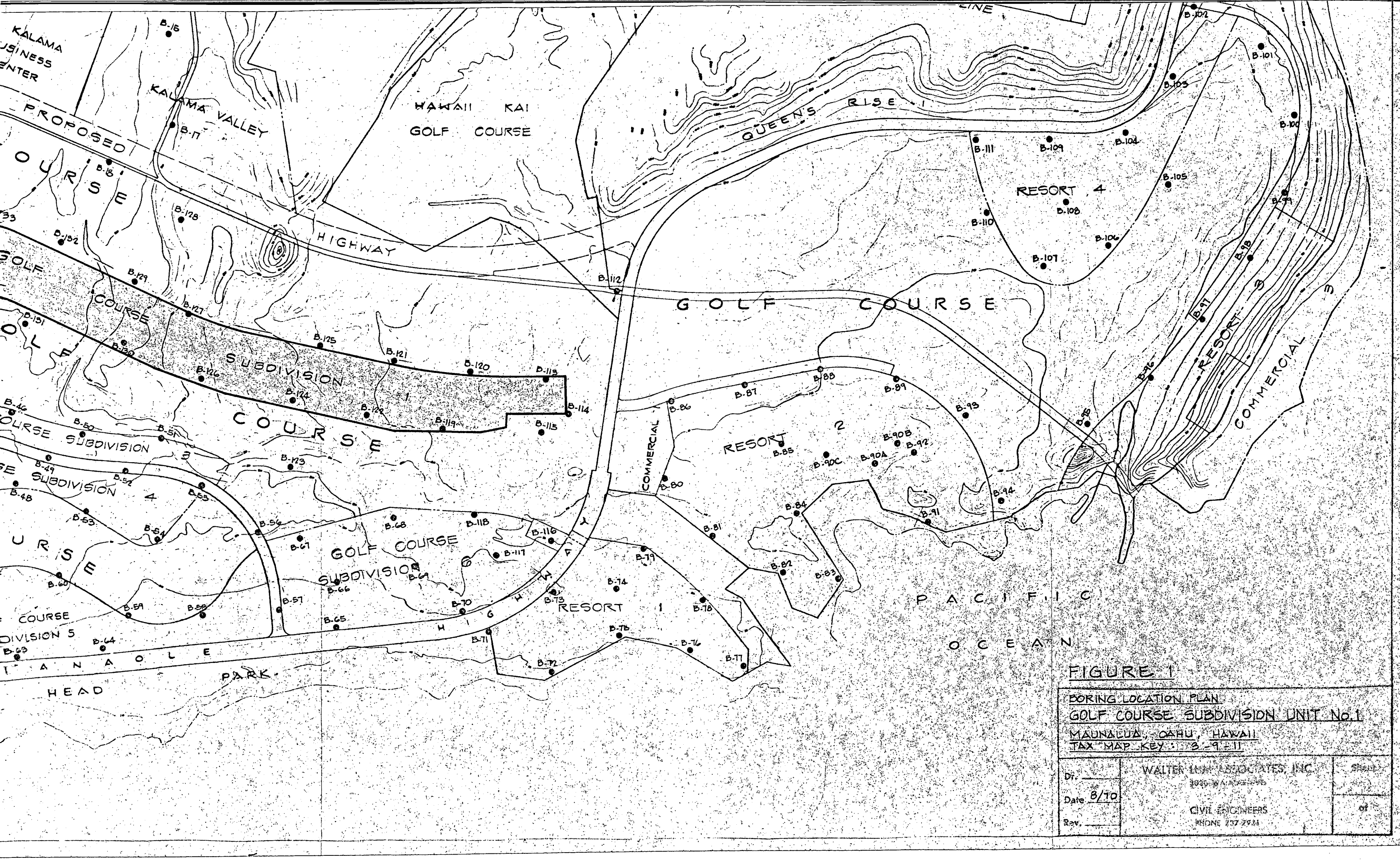


FIGURE 1

BORING LOCATION PLAN
GOLF COURSE SUBDIVISION UNIT No. 1
MAUNALUA, OAHU, HAWAII
TAX MAP KEY: 3-9-11

Dr.	WALTER LUM ASSOCIATES, INC.	Sheet
Date 8/70	CIVIL ENGINEERS	of
Rev.	PHONE 737-7931	

QUEENS

GOLF

RESORT 2

COMMERCIAL

RESORT 1

HAWAII KAI GOLF COURSE

HIGHWAY

GOLF COURSE SUBDIVISION

GOLF COURSE

GOLF COURSE SUBDIVISION 3

GOLF COURSE SUBDIVISION 4

GOLF COURSE SUBDIVISION 5

GOLF COURSE SUBDIVISION 2

PROPOSED GOLF COURSE

MA VALLEY

EXISTING

PROPOSED

SCHOOL

TREATMENT PLANT

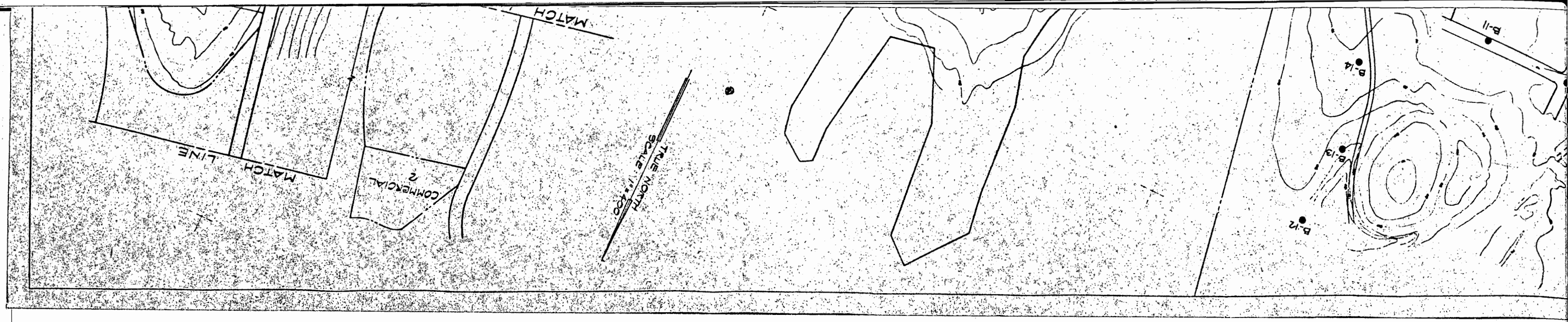
SEWAGE

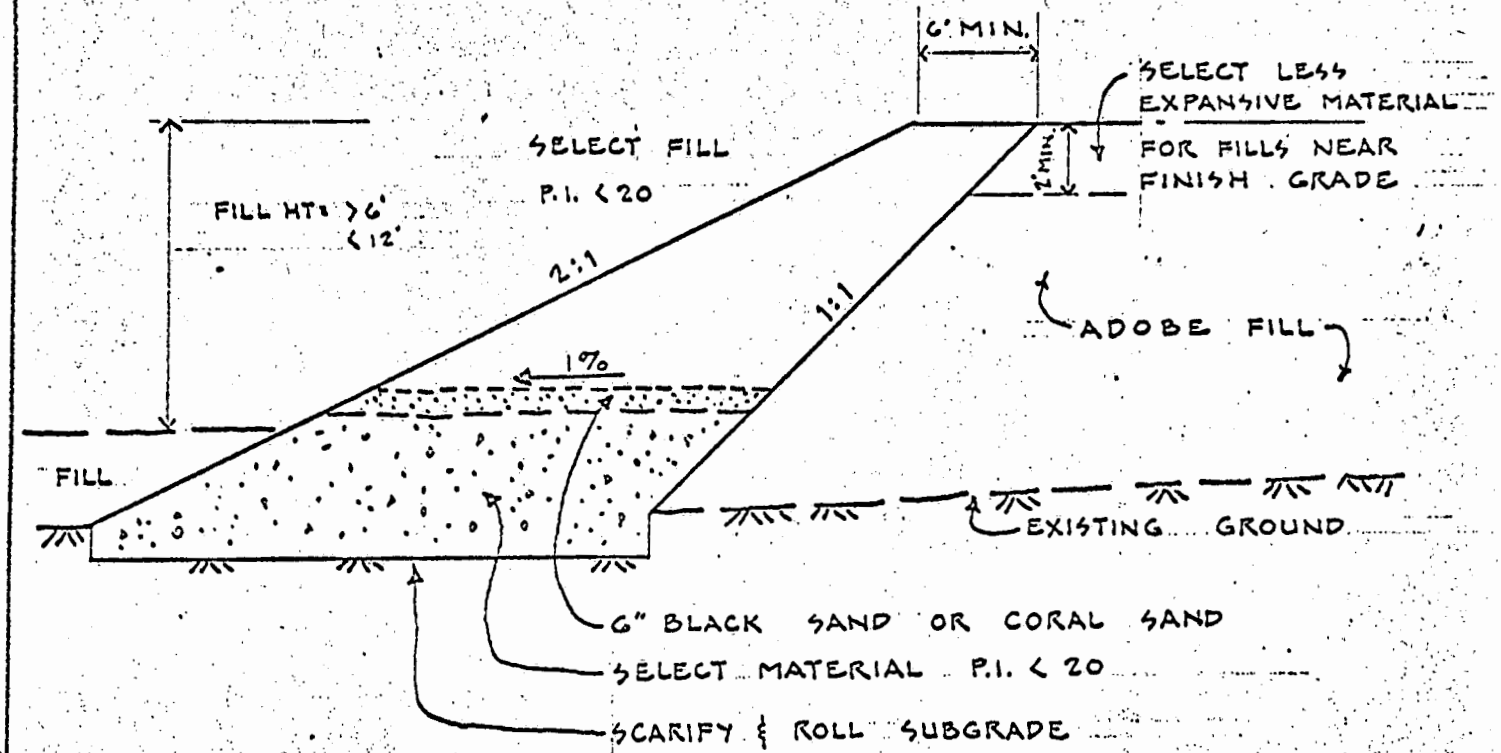
KOKO HEAD PARK

KOKO HEAD

KALANIANAOLE


B-7
KALAMA VALLEY I
B-8
B-9
B-10
B-11
B-12
B-13
B-14


MATCH
MATCH LINE
COMMERCIAL
2
TRUE NORTH
SCALE 1" = 200'
B-11
B-14
B-13
B-12



SECTION

NOT TO SCALE

FIGURE 2

TYPICAL SLOPE TREATMENT FOR CUTS & FILLS IN ADOBE.

GOLF COURSE SUBDIVISION UNIT NO. 1

MAUNALUA, OAHU, HAWAII

TAX MAP KEY: 3-2-11

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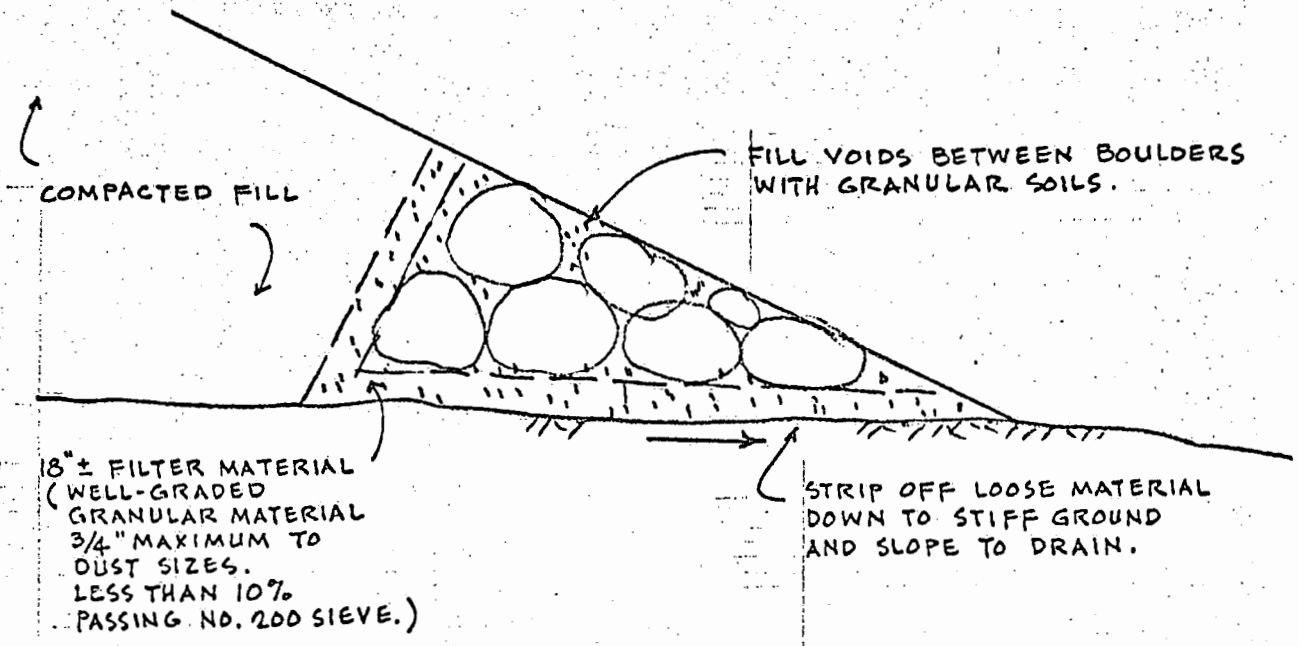
AUGUST, 1970



SECTION

NOT TO SCALE

FIGURE 3
PROPOSED BOULDER FILL

GOLF COURSE SUBDIVISION UNIT NO. 1

MAUNALUA , OAHU , HAWAII

TAX MAP KEY: 3-2-11

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